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| 15. Supplementary Notes | | | |
| 16. Abstract <p>The overall objective of this research investigation is to compare LANDSAT 1 and 2 imagery for land use change detection which may be correlative with variations in water quality.</p> <p>Analysis of historical water quality has revealed that while point-source pollution can be generally detected using the water quality sampling data collected by both State and Federal Agencies, non-point source contamination attributable to changing land use is usually completely masked. During the past quarterly period, data analysis would suggest that storm event water quality sampling is far more indicative of the actual influence of land use than information collected during scheduled periods. Four sites having different land use and geologic characteristics have been selected for the collection of storm event data. In addition we are developing a computer program to analyze, model, and predict water quality under varying conditions.</p> | | | |
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LAND USE CHANGE DETECTION WITH LANDSAT-2 DATA FOR MONITORING AND
PREDICTING REGIONAL WATER QUALITY DEGRADATION

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May 1976
Quarterly Progress Report 28 January 1976 - 27 April 1976

Prepared for

GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland 20771

ABSTRACT

The quality of surface waters can be influenced by many factors; however, land usage now appears to be the dominating factor causing the change in water quality of most streams and rivers in the United States. The extent to which land use change detection with LANDSAT 1 and 2 data can be used for monitoring and predicting regional water quality degradation is the fundamental question to be answered by this investigation. There are two obvious approaches that can be used in evaluating LANDSAT applicability; first, LANDSAT 1 and 2 imagery could be compared for change detection, then areas of change examined for water quality trends; and second, one might observe changes in historical water quality records and then determine if any land use changes have occurred. During the initial phases of this research investigation we have used both approaches.

LANDSAT 1 and 2 imagery analysis has revealed significant changes in land use in the forested areas of Arkansas; however, historical water quality data coincident with these same areas are not available. Based on water quality data analysis for the entire State of Arkansas, it has become apparent that most samples contained in historical records do not reveal the influence of changing land use because they are normally collected at times of low flow. Examination of storm-event data suggests that this type of sampling is of utmost importance in estimating non-point source contaminants.

A stream sampling program has been designed to determine water quality loadings for base-flow conditions, and storm-events. The sites reflect

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variations in land use and geological characteristics. We are completing the development of a computer program which will allow analysis of a great amount of water quality data, as well as land use parameters.

Introduction

Areas of obvious land use change (mostly forest clearcutting) detected by comparing LANDSAT 1 and 2 imagery often do not coincide with any of the sampling stations within the State's network, and consequently historical data are lacking. Even where adequate water quality data are available, it is becoming obvious that samples have been collected during the time period which does not reflect the true relationship between water quality and land use. For example, when flow information is analyzed with water quality records, much of the collecting is accomplished during low flow or base flow conditions. While point-source pollution (sewage effluent, etc.) may be obvious during low flow, most nonpoint-source contamination attributable to changing land use, will not be reflected in the water quality. More specifically, during base flow conditions, we are seeing mostly groundwater in the streams, the quality of which is controlled primarily by the kind of rocks and soil through which the water moves. The water quality of surface runoff (which will be influenced by land use) then, will have maximum influence on a stream's water quality during storm events, and not during times of base flow.

In an attempt to accomplish the objectives of our LANDSAT investigation, we have reoriented our objectives to include two additional approach phases. First, we have selected several test sites to obtain storm event

data during the high flow winter months of 1975, and spring and early summer months of 1976. These sampling sites include areas of contrasting land use, but having similar geologic and geomorphic characteristics. The second phase meshes nicely with the first just mentioned, i.e. in an attempt to make use of the historical water quality data, we are attempting to develop a computer program to analyze, model, and predict water quality under varying conditions, including land use. In contrast to our previous data analyses, event data will be introduced as an integral part of this computer model.

Problems

None

Accomplishments

Storm Event Data Collection. Four sampling sites were selected for diversity in land use and geological characteristics. Two generalized areas were defined on LANDSAT imagery and topographic maps; 1) an area dominated by urbanization, and 2) an area characterized by agricultural land use. Within each area a control stream has been selected where minimal land use was in evidence. The control streams will provide "background" water quality data, which can be compared with the "test" stream where land use changes are obvious.

Computer Modeling

An attempt is being made to derive a characteristic set of curves that will reflect the water quality for a specific point. However, as previously

Indicated, historical water quality data will be of minimal value because of the low flow characteristics. While land usage can be inferred from some historical data analyses, the most comprehensive data set will be derived from storm events. Quantitative differences in definitive curves with the same general shape have been found at several stations, and we would eventually hope to demonstrate that these types of variations are due to varying streamflow mass values from station to station. With our intended data analysis program, when precise determinations are made as to the causes of varying parameter value curves, the computer will be programmed to accept this material and an attempt will be made to predict water quality changes under varying land use conditions.

Significant Results None

Publications None

Recommendations None

Funds Expended Latest computer print-out from University dated
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Data Use

Value of
Data Allowed

\$1,400.00

Value of
Data Ordered

\$1,076.00

Value of
Data Received

\$1,076.00

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